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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,404	12/13/2001	Richard Spitz	10191/1993	5115

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EXAMINER
ESTRADA, MICHELLE

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/914,404	SPITZ ET AL.	
	Examiner	Art Unit	
	Michelle Estrada	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 March 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *13-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 13-14, 16-19, 21 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Rosnowski (4,099,997).

Rosnowski discloses applying a solid glass layer (18/19) by chemical vapor deposition (Col. 2, lines 24-25), provided with a dopant on at least one of two sides of the semiconductor wafer (12); heating the semiconductor wafer to a high temperature (Col. 2, lines 44-45) so that the dopant from the solid glass layer penetrates deep into the semiconductor wafer to produce the at least one doped region (28/32) (Col. 3, lines 11-18); removing the solid glass layer (Col. 3, lines 41-42); and providing a dopant dosage of at least $1x10^{18}$ atoms/cm^3 (Col. 3, lines 15-17); wherein the step of heating the semiconductor wafer is performed in an oxidizing atmosphere (Col. 2,lines 44-48); maintaining the high temperature for about 20 to 140 hours, this range overlaps with that of the present invention; wherein the solid glass layer is applied both on the front side of the semiconductor wafer and on the back side of the semiconductor wafer, the doping type of the dopant on the back side being opposite compared to the doping type of the dopant on the front side (Col. 2, lines 20-23); wherein the solid glass layer has a

dopant constituent of 17% to 20% by weight (Col. 2, lines 29-30); wherein the solid glass layer has a thickness of about 6000Å.

The choice of a particular thickness for the solid glass layer would have been a matter of routine optimization because thickness is considered a result effective variable. See MPEP 2144.05.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 15, 22 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosnowski as applied to claims 13-14, 16-19, 21 and 25 above, and further in view of Schwalke (5,496,765).

Rosnowski does not disclose the chemical vapor deposition operation is performed as atmospheric pressure; the solid glass layer has a dopant constituent of about 3 to 6 percentage by weight; and that the step of removing the solid glass layer is performed in accordance with hydrofluoric acid.

Schwalke discloses depositing a doped glass (BSG) layer (7) on a semiconductor wafer 1 by a CVD method at atmospheric pressure (APCVD) (Col 4, lines 26-28; the doped glass has a dopant constituent of 4% by weight, this overlaps the

range of the instant invention (Col. 4. lines 29-30); heating the wafer to diffuse the dopants and removing the glass layer using hydrofluoric acid (Col. 4,lines 48-51).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski and Schwalke to enable formation of the doped glass layer and further removing the glass layer after formation of diffusion region avoids an uncontrolled drive-out from these layers or a contamination of the equipment during the course of the further process execution (Col. 1,lines 62-64).

Claims 20, 23, 24, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosnowski as applied to claims 13-14, 16-19, 21 and 25 above, and further in view of Evans Jr., et al. (4,104,091) and Weijland (3,907,615).

Rosnowski does not disclose that the doping type of the dopant on the backside of the semiconductor wafer being opposite or different compared to the doping type of the dopant in the front side; and wherein the high temperature is between 1200 °C and 1280 °C.

Evans Jr. et al. discloses depositing two layers of doped glass on opposed surfaces of a semiconductor substrate; the dopant of the second layer of doped glass must be of a different type of conductivity from that of the first dopant glass (Col. 7, line 40-Col. 8, line 14); and heating to diffuse dopants from the glass to the substrate.

Weijland discloses depositing glass (13) on both surfaces of semiconductor substrate and heating at 1280 °C, which overlaps the range of 1200 °C to 1280 °C, to diffuse the dopants into the substrate (Col. 5, lines 19-22, Col. 5, lines 35-40).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Evans Jr., et al. and Weijland to enable formation of the doped glass layer of Rosnowski and further providing different type of dopants having different diffusion rates.

Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosnowski as applied to claims 13-14, 16-19, 21 and 25 above, and further in view of Shinohara (JP 59-80928).

Rosnowski does not disclose further applying a neutral glass layer on the solid glass layer prior to heating the semiconductor wafer; and removing the neutral glass layer together with the solid glass layer after heating the semiconductor wafer; the neutral glass layer has a thickness of about 0.5 micrometers.

Shinohara discloses applying a neutral glass (13) on a substrate (1) prior to heating the semiconductor substrate and removing the neutral glass after heating (Abstract and Figs. 3 and 4).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski and Shinohara to enable formation of the heavily doped semiconductor components of Rosnowski and further the neutral glass layer protects the solid glass layer and prevents the dopants from leaking to the atmosphere.

The choice of a particular thickness for the neutral glass layer would have been a matter of routine optimization because thickness is considered a result effective variable. See MPEP 2144.05.

Response to Arguments

Applicant argues that Rosnowski does not describe heating the semiconductor wafer to a high temperature so that the dopant from the solid glass layer penetrates into the semiconductor wafer. However, in Col. 2, lines 44-45, Rosnowski discloses a heating step before removing the glass layer. This heating process would diffuse some dopants into the substrate. Claims 13-28 do not require that the dopants are diffused deeply in the substrate nor do they require a specific temperature and period of time. The use of the temperature recited in claims 29 and 30 has been addressed above.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues that Weijland does not disclose that heating the doped glass layer at a given concentration drives the dopant deeply into the substrate. However, Weijland discloses the diffusion of dopant as recited in claims 29 and 30, Applicant is directed to Col. 5, lines 15-40, the range of temperature overlaps with the temperature claimed in the present invention.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is (703) 308-0729. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

George Fourson
Primary Examiner
Art Unit 2823

MEstrada
April 21, 2003